

What is claimed is:

1. A composition comprising:
  - (a) at least one protein comprising the amino acid sequence of any of SEQ ID NOS:444-452;
  - 5 (b) at least one protein comprising an amino acid sequence that is encoded by a polynucleotide that hybridizes under stringent conditions to any of the polynucleotides that encode any of SEQ ID NOS: 444-452;
  - (c) at least one immunogenic portion of at least one protein described in (a) or (b); or
- 10 (d) at least one biological equivalent of at least one protein described in (a) or (b) or immunogenic portion described in (c).
2. The composition of claim 1, wherein the at least one protein comprises the amino acid sequence of any of SEQ ID NOS:444-449.
3. The composition of claim 1, wherein the at least one protein  
15 comprises any of SEQ ID NOS:450-452.
4. The composition of claim 1, wherein the at least one protein encoded by a polynucleotide that hybridizes under stringent conditions to a polynucleotide is encoded by the polynucleotide that hybridizes under stringent conditions to a polynucleotide that encodes any of SEQ ID NOS:444-449.
- 20 5. The composition of claim 1, wherein the at least one protein encoded by a polynucleotide that hybridizes under stringent conditions to a polynucleotide is encoded by the polynucleotide that hybridizes under stringent conditions to a polynucleotide that encodes any of SEQ ID NOS:450-452.
6. The composition of claim 1, wherein the composition additionally  
25 comprises at least one Por A, Por B, transferrin binding protein, or opacity protein (Opc).
7. The composition of claim 1, wherein the composition additionally comprises at least one additional surface antigen of *Neisseria species*, said additional surface antigen being a non-ORF2086 protein.

8. The composition of claim 1, wherein the at least one protein has a molecular weight of about 26,000 to about 30,000 as measured by mass spectroscopy.

9. The composition of claim 1, wherein the at least one protein has a  
5 molecular weight of about 28-35 kDa as measured on a 10%-20% SDS polyacrylamide gel.

10. The composition of claim 1, wherein said composition additionally comprises a pharmaceutically acceptable buffer, diluent, adjuvant or carrier.

11. The composition of claim 1, wherein said composition additionally  
10 comprises a carrier.

12. The composition of claim 1, wherein said composition additionally comprises an adjuvant.

13. The composition of claim 12, wherein said adjuvant comprises a liquid.

15 14. The composition of claim 1, wherein the protein is non-lipidated.

15. The composition of claim 1, wherein the protein is a recombinant protein.

16. The composition of claim 1, wherein the protein is isolated from native *Neisseria species*.

20 17. The composition of claim 1, wherein the protein is a lipoprotein.

18. The composition of claim 1, wherein said composition additionally comprises a polysaccharide.

25 19. The composition of claim 60, wherein said composition comprises an additional peptide, polypeptide or protein, said composition forming a conjugate that induces an immune response to two or more bacteria in a mammal.

20. A composition comprising:

(a) at least one protein comprising the amino acid sequence of any of odd numbered SEQ ID NOS:331-443;

30 (b) at least one protein encoded by a polynucleotide that hybridizes under stringent conditions to a polynucleotide comprising the nucleic acid sequence of any of even numbered SEQ ID NOS:330-442;

(c) at least one immunogenic portion of at least one protein described in (a) or (b); or

(d) at least one biological equivalent of at least one protein described in (a) or (b) or immunogenic fragment described in (c).

5 21. The composition of claim 20, wherein the at least one protein comprises the amino acid sequence of any of odd numbered SEQ ID NOS:433-443.

23. The composition of claim 20, wherein the at least one protein comprises any of odd numbered SEQ ID NOS:331-431.

10 24. The composition of claim 20, wherein the at least one protein encoded by a polynucleotide that hybridizes under stringent conditions to a polynucleotide is encoded by the polynucleotide that hybridizes under stringent conditions to any of even numbered SEQ ID NOS:432-442.

15 25. The composition of claim 20, wherein the at least one protein encoded by a polynucleotide that hybridizes under stringent conditions to a polynucleotide is encoded by the polynucleotide that hybridizes under stringent conditions to any of even numbered SEQ ID NOS:330-430.

20 26. The composition of claim 20, wherein the composition additionally comprises at least one Por A, Por B, transferrin binding protein, or opacity protein (Opc).

27. The composition of claim 20, wherein the composition additionally comprises at least one additional surface antigen of *Neisseria species*, said additional surface antigen being a non-ORF2086 protein.

25 28. The composition of claim 20, wherein the at least one protein has a molecular weight of about 26,000 to about 30,000 as measured by mass spectroscopy.

29. The composition of claim 20, wherein the at least one protein has a molecular weight of about 28-35 kDa as measured on a 10%-20% SDS polyacrylamide gel.

30. A composition comprising:

at least one antigen of a first bacterial strain of *Neisseria species* that provides immunogenicity against infection of a subject by a second bacterial strain of *Neisseria species*;

5 wherein the first strain is strain M98 250716 of *Neisseria meningitidis* serogroup B and said second strain is another strain of *Neisseria meningitidis* serogroup B.

31. A composition comprising:

at least one antigen of a first bacterial strain of *Neisseria species* that provides immunogenicity against infection of a subject by a second bacterial strain 10 of *Neisseria species*;

wherein the first strain is any of the strains selected from the group consisting of CDC-5315, B40, M97 250571, CDC-2367, CDC-1343, CDC-983 and CDC-852 of *Neisseria meningitidis* serogroup B and said second strain is another strain of *Neisseria meningitidis* serogroup B.

15 32. A composition comprising:

at least one isolated protein comprising the amino acid sequence of SEQ ID NO:301;

wherein x is any amino acid;

20 wherein the region from amino acid position 5 to amino acid position 8 is any of 0 to 4 amino acids;

wherein the region from amino acid position 66 to amino acid position 68 is any of 0 to 3 amino acids; and

wherein the at least one isolated protein further comprises the amino acid sequence of any of SEQ ID NOS:444-449.

25 33. The composition of claim 32, wherein the region from amino acid position 5 to amino acid position 8 comprises 0 or 4 amino acids

34. The composition of claim 32, wherein the region from amino acid position 66 to amino acid position 68 comprises 0 or 3 amino acids.

35. A composition comprising:

30 at least one isolated protein comprising the amino acid sequence of SEQ ID NO:302;

wherein x is any amino acid;

wherein the region from amino acid position 8 to amino acid position 12 is any of 0 to 5 amino acids and

wherein the at least one isolated protein further comprises the amino acid sequence of any of SEQ ID NOS:450-452.

36. The composition of claim 35, wherein the region from amino acid position 8 to amino acid position 12 comprises 0 or 5 amino acids.

37. A composition comprising:

at least one antibody that immunospecifically binds with any of:

10 (a) at least one protein comprising the amino acid sequence of any of SEQ ID NOS:444-452;

(b) at least one protein comprising an amino acid sequence that is encoded by a polynucleotide that hybridizes under stringent conditions to any of the polynucleotides that encode any of SEQ ID NOS: 444-452; or

15 (c) at least one immunogenic portion of at least one protein described in (a) or (b); or

(d) at least one biological equivalent of at least one protein described in (a) or (b) or one immunogenic portion described in (c).

38. The composition of claim 37, wherein the antibody is a monoclonal 20 antibody.

39. The composition of claim 37, additionally comprising a pharmaceutically acceptable carrier.

40. A composition comprising:

at least one antibody that immunospecifically binds with any of:

25 (a) at least one protein comprising any of odd numbered SEQ ID NOS:331 to 443; or

(b) at least one immunogenic portion of at least one protein described in (a); or

(c) at least one biological equivalent of at least one protein described in 30 (a) or one immunogenic fragment described in (b).

41. The composition of claim 40, wherein the at least one protein, immunogenic portion thereof or biological equivalent thereof comprises any of SEQ ID NOS:444-452.

5 42. The composition of claim 40, wherein the at least one antibody is a monoclonal antibody.

43. A composition comprising:

at least one polynucleotide that (a) encodes at least one isolated protein comprising any of SEQ ID NOS:444-452, or (b) hybridizes under stringent conditions to any of the polynucleotides described in (a).

10 44. The composition of claim 43, additionally comprising a P4 leader sequence (SEQ ID NO. 322).

45. The composition of claim 43, wherein said composition comprises a vector.

15 46. The composition of claim 43, wherein the stringent conditions are high stringency southern hybridization conditions.

47. The composition of claim 43, wherein the polynucleotide is a recombinant polynucleotide.

48. The composition of claim 43, wherein the polynucleotide is isolated from a natural source.

20 49. The composition of claim 43, wherein said composition additionally comprises a nucleic acid sequence encoding for an additional peptide, polypeptide or protein.

50. A composition comprising:

a vector comprising any of:

25 (a) at least one protein comprising the amino acid sequence of any of SEQ ID NOS:444-452; or

(b) at least one immunogenic portion of at least one protein described in (a); or

30 (c) at least one biological equivalent of at least one protein described in (a) or immunogenic fragment described in (b).

51. The composition of claim 50, wherein the vector is a plasmid.

52. The composition of claim 50, wherein the vector is a phage.
53. The composition of claim 50, wherein the vector is a bacteriophage.
54. The composition of claim 50, wherein the vector is a moderate phage.
55. A composition comprising:
  - 5 a vector comprising at least one polynucleotide that encodes a protein comprising the amino acid sequence of SEQ ID NO:300;  
wherein x is any amino acid;  
wherein the region from amino acid position 5 to amino acid position 9 is any of 0 to 5 amino acids;
  - 10 wherein the region from amino acid position 67 to amino acid position 69 is any of 0 to 3 amino acids;  
wherein amino acid position 156 is any of 0 to 1 amino acid; and  
wherein the protein further comprises any of SEQ ID NOS:444-449.
56. A composition comprising:
  - 15 a vector comprising any of:
    - (a) at least one polynucleotide that encodes at least one of the polypeptides of the odd numbered SEQ ID NOS: 331-443; or
    - (b) at least one polynucleotide that hybridizes under stringent conditions to at least one polynucleotide of (a).
  - 20 57. The composition of claim 56, wherein the vector comprises the nucleic acid sequence of any of even numbered SEQ ID NOS:330-442.
  58. A composition comprising:
    - a host cell transformed/transfected or infected with a vector, said vector comprising any of:
      - 25 (a) at least one protein encoded by an open reading frame of *Neisseria species* (ORF2086), said open reading frame encoding a crossreactive immunogenic antigen, and said crossreactive immunogenic antigen providing immunogenicity against infection by *Neisseria meningitidis* serogroup B in a subject; or
      - (b) at least one immunogenic portion of at least one protein described in
    - 30 (a); or

(c) at least one biological equivalent of at least one protein described in (a) or immunogenic fragment described in (b).

5 59. A composition comprising:  
a host cell transformed/transfected or infected with a vector, said vector comprising any of :

(a) at least one protein comprising any of SEQ ID NOS:444-452; or  
(b) at least one immunogenic portion of at least one protein described in (a); or

10 (c) at least one biological equivalent of at least one protein described in (a) or immunogenic portion described in (b).

60. A composition prepared by a process comprising:  
isolating and purifying from *Neisseria species* any of:  
(a) at least one protein encoded by an open reading frame of *Neisseria species* (ORF2086), said open reading frame encoding a crossreactive immunogenic antigen, and said crossreactive immunogenic antigen providing immunogenicity against infection by *Neisseria meningitidis* serogroup B in a subject; or  
(b) at least one immunogenic portion of at least one protein described in (a); or  
(c) at least one biological equivalent of at least one protein described in (a) or immunogenic fragment described in (b); and

wherein the at least one polynucleotide comprises the nucleic acid sequence of any of the even numbered SEQ ID NOS:330-442.

61. The composition of claim 60, wherein the process further comprises introducing a non-native leader sequence to the at least one isolated polynucleotide.

25 62. The composition of claim 61, wherein the non-native leader sequence is P4 leader sequence (SEQ ID NO. 322).

63. A composition prepared by a process comprising:  
isolating and purifying from *Neisseria species* any of:  
(a) at least one protein comprising any of SEQ ID NOS:444-452; or  
30 (b) at least one immunogenic portion of at least one protein described in (a); or

(c) at least one biological equivalent of at least one protein described in (a) or immunogenic portion described in (b).

64. A composition prepared by a process comprising:  
isolating and purifying from *Neisseria species* any of:

5 (a) at least one protein comprising the amino acid sequence of any of odd numbered SEQ ID NOS:331-443;

(b) at least one protein encoded by a polynucleotide that hybridizes under stringent conditions to a polynucleotide comprising the nucleic acid sequence of any of even numbered SEQ ID NOS:330-442;

10 (c) at least one immunogenic portion of at least one protein described in (a) or (b); or  
(d) at least one biological equivalent of at least one protein described in (a) or (b) or immunogenic fragment described in (c).

65. A composition comprising:  
15 at least one immunogenic non-strain specific *Neisseria meningitidis* antigen, said antigen being nonpathogenic and substantially free from any infectious impurities;  
wherein the antigen comprises an amino acid sequence having at least about 70% amino acid sequence identity to any of odd numbered SEQ ID NOS:331-443.

20 66. Use of the composition of any of claims 1-65 in the preparation of a medicament for inducing an immune response in a mammal.

67. The use according to claim 66, wherein said composition is administered parenterally.

25 68. The use according to claim 66, wherein said composition is administered mucosally.

69. The use of the composition of any of claims 1-65 in a medicament effective against bacterial meningitis in a mammal.

70. The use of the composition according to claim 69, wherein said composition is administered parenterally.

30 71. The use of the composition according to claim 69, wherein said composition is administered mucosally.

72. The use of the composition according to claim 69, wherein the composition is administered by subcutaneous or intramuscular injection.

73. A method of preparing a composition comprising:  
expressing in a host cell a nucleic acid sequence encoding any of:

5 (a) at least one protein encoded by an open reading frame of *Neisseria species* (ORF2086), said open reading frame encoding a crossreactive immunogenic antigen, and said crossreactive immunogenic antigen providing immunogenicity against infection by *Neisseria meningitidis* serogroup B in a subject; or

10 (b) at least one immunogenic portion of at least one protein described in  
(a); or

(c) at least one biological equivalent of at least one protein described in  
(a) or immunogenic fragment described in (b); and  
wherein the at least one protein comprises any of the SEQ ID NOS: 444-452.

15 74. The method of claim 73, wherein the nucleic acid sequence is expressed *in vivo*.

75. The method of claim 73, wherein the nucleic acid sequence is expressed *in vitro*.

76. The method of claim 73, further comprising associating a P4 leader sequence (SEQ ID NO. 322).

20 77. A method of preparing a composition comprising:  
isolating and purifying from *N. meningitidis* at least one polynucleotide that  
(a) encodes at least one protein encoded by an open reading frame of *Neisseria species* (ORF2086) or at least one immunogenic portion or biological equivalent of  
said at least one protein, said open reading frame encoding a crossreactive  
25 immunogenic antigen, and said crossreactive immunogenic antigen providing  
immunogenicity against infection by *Neisseria meningitidis* serogroup B in a  
subject; or (b) hybridizes under stringent conditions to any of the polynucleotides  
described in (a).

78. The method of claim 77, wherein the stringent conditions are high  
30 stringency southern hybridization conditions.

79. A method of preparing a composition comprising:

isolating and purifying from *Neisseria species* any of the proteins, immunogenic portions or biological equivalents described herein.

5 80. A method of preparing an antibody composition comprising:  
recovering antibodies from an animal after introducing into the animal a  
composition comprising any of the proteins, immunogenic portions or biological  
equivalents described herein.

10 81. A method of inducing an immune response in a mammal comprising:  
administering to the mammal an effective amount of one or more of the  
compositions of claims 1-65.

82. The method of claim 81, wherein said composition is administered  
parenterally.

83. The method of claim 81, wherein said composition is administered  
mucosally.

15 84. A method of preventing or treating bacterial meningitis in a mammal  
comprising:

administering to the mammal an effective amount of one or more of the  
compositions of claims 1-65.

85. The method of claim 84, wherein said composition is administered  
parenterally.

20 86. The method of claim 84, wherein said composition is administered  
mucosally.

87. The method of claim 84, wherein the composition is administered by  
subcutaneous or intramuscular injection.

25 88. A method of preventing or treating bacterial meningitis in a mammal  
comprising:

administering to the mammal an effective amount of an antibody  
composition comprising antibodies that immunospecifically bind with a protein,  
immunogenic portion or biological equivalent comprising the amino acid sequence  
of any of the odd numbered SEQ ID NOS: 331-443 or any of the SEQ ID NOS:  
30 444-452.

89. The method of claim 88, wherein the antibody composition is administered parenterally.

90. The method of claim 88, wherein the antibody composition is administered mucosally.

5 91. The method of claim 88, wherein the antibody composition is administered by subcutaneous or intramuscular injection.

92. A method of preparing a composition comprising:  
expressing in a host cell a nucleic acid sequence encoding any of:

10 (a) at least one protein comprising the amino acid sequence of any of odd numbered SEQ ID NOS:331-443 or any of the SEQ ID NOS: 254-299;

(b) at least one protein encoded by a polynucleotide that hybridizes under stringent conditions to a polynucleotide comprising the nucleic acid sequence of any of even numbered SEQ ID NOS:330-442;

15 (c) at least one immunogenic portion of at least one protein described in  
(a) or (b); or

(d) at least one biological equivalent of at least one protein described in  
(a) or (b) or immunogenic fragment described in (c).

93. The method of claim 92, wherein the nucleic acid sequence is expressed *in vivo*.

20 94. The method of claim 92, wherein the nucleic acid sequence is expressed *in vitro*.

95. The method of claim 92, wherein the vector is a plasmid.

96. The method of claim 92, wherein the vector is a phage.

25 97. The method of claim 92, further comprising associating a non-native leader sequence with said at least one isolated polynucleotide.

98. The method of claim 97, wherein the non-native leader sequence is P4 leader sequence (SEQ ID NO. 267).

99. A method of preparing an antibody composition comprising:  
recovering antibodies from an animal after introducing into the animal a  
30 composition comprising:

(a) at least one protein comprising the amino acid sequence of any of the odd numbered SEQ ID NOS:331-443 or the amino acid sequence of any of SEQ ID NOS:444-452; or

5 (b) at least one protein encoded by a polynucleotide that hybridizes under stringent conditions to the polynucleotide of any of the even numbered SEQ ID NOS: 330-442.

100. The method of claim 99, wherein the stringent conditions are high stringency southern hybridization conditions.

101. A transformed/transfected or infected cell line comprising:  
10 a recombinant cell that expresses a nucleic acid sequence that (a) encodes at least one isolated protein comprising the amino acid sequence of any of SEQ ID NOS:444-452, or (b) hybridizes under stringent conditions to any of the polynucleotides described in (a).

102. A transformed/transfected or infected cell line comprising:  
15 a recombinant cell that expresses a nucleic acid sequence that (a) encodes at least one protein encoded by an open reading frame of *Neisseria species* (ORF2086) or at least one immunogenic portion or biological equivalent of said at least one protein, said open reading frame encoding a crossreactive immunogenic antigen, and said crossreactive immunogenic antigen providing immunogenicity against infection  
20 by *Neisseria meningitidis* serogroup B in a subject or (b) hybridizes under stringent conditions to any of the polynucleotides of (a); or

25 a recombinant cell that expresses a nucleic acid sequence encoding: (c) at least one polypeptide encoded by any of (a) or (b); or (d) at least one polypeptide comprising the amino acid sequence of any of the odd numbered SEQ ID NOS:331-443.

103. The transformed/transfected or infected cell line of claim 102, wherein the polypeptide is a monoclonal antibody.

104. The transformed/transfected or infected cell line of claim 102, wherein the recombinant cell is a hybridoma.

30 105. The transformed/transfected or infected cell line of claim 102, wherein the recombinant cell is a trioma.

106. A transformed/transfected or infected cell line comprising:  
a recombinant cell that expresses a nucleic acid sequence comprising:  
(a) at least one polynucleotide that encodes a protein comprising  
any of the odd numbered SEQ ID NOS:331-443;  
5 (b) at least one polynucleotide comprising the nucleic acid  
sequence of any of the even numbered SEQ ID NOS:330-442;  
(c) at least one polynucleotide that hybridizes under stringent  
conditions to any of (a) or (b); or  
a recombinant cell that expresses a nucleic acid sequence encoding:  
10 (d) at least one polypeptide encoded by any of (a), (b) or (c); or  
(e) at least one polypeptide comprising the amino acid sequence  
of any of the odd numbered SEQ ID NOS:331-443.

107. The transformed/transfected or infected cell line of claim 106,  
wherein the polypeptide is a monoclonal antibody.

15 108. The transformed/transfected or infected cell line of claim 106,  
wherein the recombinant cell is a hybridoma.

109. The transformed/transfected or infected cell line of claim 106,  
wherein the recombinant cell is a trioma.

110. A composition as substantially hereinbefore described.

20 111. A use substantially as hereinbefore described.